Bowman Consulting LLC
4060 Fenton Road
Hartland, Michigan 48353

Engineering Report
Powledge v. General Motors Corporation
February 18, 2009

I am a mechanical engineer with over 36 years of experience in automotive engineering. I received a Bachelor of Science Degree from Rochester Institute of Technology in 1971 and a Master of Science Degree from Stanford University in 1972. I have completed the Traffic Accident Reconstruction course at Northwestern University. My Curriculum Vitae is attached.

Material Reviewed

I have reviewed the following documents relating to this case:

Texas Accident Report # 05-10172
Deposition of Corporal C. Rich
Deposition of B. Quiroga
Deposition of R. Klibert
Report by Mr. S. Syson
80 MPH video of path
Photographs of exemplar throttle body
Photographs of scene by Dr. Andrews
Photographs of exemplar cruise control
Photographs of exemplar throttle cable
Photographs by Texas City Police
Photographs by Texas City Fire Marshal
Photographs by M. Byrd
Photographs by D. McKendry
Photographs of vehicle-source unknown
Video of scene by L. Williams
Photographs of scene by L. Williams
Photographs by Scientific Analysis

Additionally, I have inspected the subject vehicle involved in this accident and have inspected the accident scene.

Accident Facts

The accident report states the crash occurred at 8:52 am Tuesday October 18, 2005 on IH45 North, ¾ miles South of Holland Road in Texas City, Texas. Mr. Adam W. Powledge was driving a 2004 Chevrolet Malibu Classic VIN: 1G1ND52F34M598780. Mr. Powledge had struck another southbound vehicle. Mr. Powledge then drove into the grass median between the south bound lanes of IH45 and a feeder road. He drove 1419 feet in the grass and then stuck a steel support beam. The vehicle split in half and then caught fire. All of the occupants were killed.

Additional Information

I participated in vehicle demonstrations specifically with regard to this matter. Two exemplar 2004 Chevrolet Malibu Classic vehicles were used to demonstrate tire marks in the grass and performance characteristics of throttle, cruise control and braking systems. One vehicle was used in the Houston, Texas area to demonstrate the tire marks left in grass at high speed, hard braking, ABS braking, locked wheel braking, with a flat tire, steering, and low speed. The other vehicle was used in the Phoenix, Arizona area at the General Motors Proving Ground to demonstrate maximum speeds and braking performance.

The demonstrations were video taped and acceleration, speed, and distance were recorded. Photographs of the vehicle and tire marks were taken. Also recorded were engine RPM, throttle position, brake switch function, cruise switch function, and pedal force on some demonstrations.

Preliminary review of the information indicates that the marks in the grass are characteristically specific to constant speed, acceleration, braking, and a flat tire. The maximum speed is about 107 MPH, the vehicle can be stopped using the brakes when the throttle is held at wide open and the brakes show specific damage when overheated.

Raw video, photographs and data; recorded with a VC3000, are attached.

Vehicle Inspection

I inspected the accident scene on November 25, 2008. The inspection consisted of walking through the scene in the grass and taking photographs.

I inspected the subject vehicle on December 11, 2008. I specifically inspected the brake system. I disassembled the rear wheels, tires and brake drum. The keepers were still on both rear drums. The rear brakes were intact and showed no adverse wear or heat degradation. The right front brake assembly was covered in melted aluminum and I did not attempt to disassemble the right front brake. I took photographs of the previously disassembled left front brake pads and measured the thickness (inboard 0.360-0.376, outboard 0.430-0.440 inches). I photographed the throttle body which was stored separate from the vehicle. I located and photographed the brake pedal assembly.

Design

The brake system on the 2004 Chevrolet Malibu Classic is vacuum power assisted dual piston hydraulic master cylinder with front disc and rear drum brakes. Some vehicles were manufactured with antilock brake system (ABS) and some were manufactured without ABS. The subject vehicle was not manufactured with ABS. All of these vehicles were manufactured with a diagonal split brake system.

Discussion

My inspection revealed that the only brake system concern is that the left front brake pads were worn beyond the replacement thickness. This is poor owner maintenance but still provided maximum braking capability. The subject vehicle did not have an ABS brake system even though the wheel bearings had ABS wheel speed sensors. This is because it is less expensive and higher quality control to manufacture all of these vehicles with ABS wheel bearings, than to have two different kinds (ABS and non-ABS). I found no evidence of overheating of either the front or rear brakes. I have run many vehicles, including an exemplar in this matter, to the point of brake failure due to overheating. This vehicle has none of the characteristics of overheating.

Mr. Syson states that the front brakes of the subject vehicle did not operate due to overheat. One of the demonstrations shows that when the front brakes overheat, the rear brakes do not work. This is because the brake system is a diagonal split. The left front and right rear brakes work off the same chamber of the master cylinder; while the right front and left rear work off the other chamber. Therefore, when the front brakes fail due to overheat the rear brakes also fail.

Mr. Syson states that a rolling tire, without braking does not leave marks in the grass. The demonstrations at both high speed and low speed clearly shows that a rolling tire does leave marks in the grass.

Mr. Syson states that because the brake pedal pad is bent, that it is proof Mr. Powledge was pushing hard on the brake pedal. I have had a demonstration done which shows that when pushing on the brake pedal pad that it only bends about 45 degrees with force applied instead of the approximately 90 degrees of the subject pedal. This is due to the direction of the applied load. After 45 degrees the force drops to zero. Attached is a copy of General Motors Corporation Test Procedure GMN5101. This states that the brake pedal shall withstand a force of 600 pounds without deformation. Six hundred pounds of force is more than a person will push with their leg and foot on the brake pedal.

Opinion

My opinions based on my education, experience, investigation and analysis of this action, to a reasonable degree of engineering certainty are:

1) The brake system on the subject 2004 Chevrolet Malibu Classic was not defective at the time of this accident.
2) The proximate cause of the accident was not the brake system.
3) The accident was caused by driver.

Respectfully submitted,

Bruce R. Bowman

CURRICULUM VITAE

BRUCE R. BOWMAN

Automotive Engineer with expertise in the design, testing, processing, manufacturing, and service maintenance of passenger cars and trucks. Primary areas include brake systems, front drive, rear axles, suspension, trailer towing, windshield wipers, engines, and carburetor. Additional expertise is in accident reconstruction and human factors of traffic accidents and driver reaction.

EDUCATION

Stanford University - Master of Science in Mechanical Engineering 1972
Rochester Institute of Technology - B.S. in Mechanical Engineering 1971
Williamsport Technical Institute - Diploma in Diesel Mechanics 1966
Cornell University - Courses in Agriculture 1964
General Motors - various courses in testing and mechanics
Northwestern University - Traffic Accident Reconstruction 1990

PROFESSIONAL ORGANIZATIONS

Society of Automotive Engineers - SAE International
Automotive Service Excellence - ASE certified mechanic

WORK HISTORY

July 2001 to Present — Bowman Consulting LLC
Product Liability Consultant

General Motors Corporation

Product Analysis – Apr.1989 to June 2001 — Senior Consultant
Investigation of concerns of General Motors products, non-litigation and litigation. Provide technical support, investigation, consultation, experimentation, analysis, and expert testimony concerning products.

Engineering Investigation – Oct.1985 to Apr.1989 — Staff Project Engineer
Investigation of field concerns of General Motors products. Provide technical investigation, experimentation, analysis and recommendations to various engineering groups within General Motors. This was not generally involved with litigation.

Brake and Bearing Systems – Oct.1982 to Oct.1985 — Staff Project Engineer
Testing and analysis of new and experimental brake systems, including antilock.

Vehicle Emission Laboratory – Sept.1972 to Oct.1982 — Project Engineer
Testing and analysis of all phases of vehicle exhaust emission technology including development of computer controlled engine parameters.

Rochester Products Division – Jan.1966 to Sept.1972 — Technician/Mechanic
Testing and development of carburetors, fuel injection, evaporative canisters, and air injection systems.

August 2008